

CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

- 1 1. A composite material, comprising:
2 at least 50 wt% graphite particles;
3 thermoplastic at 10 to 50 wt%; and
4 reinforcing fibers at 5 to 15 wt%,
5 wherein the bulk conductivity is at least 150 S/cm.
- 1 2. The composite material of claim 1 wherein the bulk conductivity is at
2 least 200 S/cm.
- 1 3. The composite material of claim 1 wherein said composite material is
2 formed in the shape of a bipolar plate.
- 1 4. The composite material of claim 3 wherein said bipolar plate has
2 features molded into at least one surface.
- 1 5. The composite material of claim 1 wherein the tensile strength is at
2 least 30 MPa.
- 1 6. The composite material of claim 1 wherein the flexural strength is at
2 least 45 MPa.
- 1 7. The composite material of claim 1 wherein the thermoplastic includes
2 more than one polymeric material.
- 1 8. The composite material of claim 7 wherein a first polymer is present in

2 a core of said composite material, and a second polymer, different from
3 said first polymer, is present on a surface of said core.

1 9. The composite material of claim 8 wherein said first polymer is
2 polyethylene terephthalate, and said second polymer is polyvinylidene fluoride.

1 10. A method of manufacturing fuel cell bipolar plates, comprising the
2 steps of:

3 forming a composite material comprising graphite particles,
4 thermoplastic polymer, and reinforcing fibers, wherein the bulk
5 conductivity is at least 150 S/cm; and
6 molding said composite material to form bipolar plates.

1 11 The method of claim 10 wherein said molding step is performed by
2 compression molding.

1 12. The method of claim 10 wherein said forming step includes the steps
2 of:

3 forming a plurality of sheets from graphite particles, thermoplastic
4 fibers and reinforcing fibers using a wet-lay process;
5 consolidating a stack of said plurality of sheets;
6 obtaining a blank from a consolidated stack, wherein said blank is
7 used in said molding step.

1 13. The method of claim 10 wherein said reinforcing fibers are selected
2 from the group consisting of carbon and glass.

1 14. The method of claim 10 wherein said molding step introduces at least
2 one feature into said bipolar plates.

1 15. The method of claim 14 wherein said at least one feature is a gas flow
2 channel.

1 16. The method of claim 10 wherein said forming step includes the steps
2 of:

3 forming a plurality of formable sheets by a wet lay process; and
4 stacking said plurality of sheets in a mold.

1 17. The method of claim 16 further comprising depositing a second
2 polymer different from said thermoplastic polymer on a top and bottom of
3 said stack.

1 18. The method of claim 16 further comprising adding graphite particles
2 to said stack.

1 19. The method of claim 10 wherein said forming and molding step occur
2 simultaneously or sequentially.

1 20. The method of claim 10 wherein said composite material produced in
2 said forming step includes a first polymer in a core of said composite
3 material and a second polymer, different from said first polymer, on a
4 surface of said core.